

2

OFFICE OF NAVAL RESEARCH

Contract N00014-91-J-1758

R&T Code 4135026---01

Technical Report No. 4

DTIC
ELECTE
JUN 11 1992
S C D

AD-A251 184



Laser Dye Spectroscopy of Some Pyrromethene-BF₂ Complexes

by

T. G. Pavlopoulos, J. H. Boyer, K. Thangaraj, G. Sathyamoorthi,
M. P. Shah, and M.-L. Soong

Submitted to

Applied Optics

U.S. Naval Ocean Systems Center
San Diego, CA 92152

and

Department of Chemistry
University of New Orleans
New Orleans, LA 70148-2820

June 2, 1992

Reproduction in whole or in part is permitted for any purpose
of the United States Government

This document has been approved for public release and sale;
its distribution is unlimited

92 6 10 18

92-15264



REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT Distribution unlimited.		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S)			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION University of New Orleans		6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION Office of Naval Research		
6c. ADDRESS (City, State, and ZIP Code) University of New Orleans New Orleans, LA 70148			7b. ADDRESS (City, State, and ZIP Code) Department of the Navy Arlington, VA 22217		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION Office of Naval Research		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N00014-91-J-1758		
8c. ADDRESS (City, State, and ZIP Code) Department of the Navy Arlington, VA 22217			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
					WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) Laser Dye Spectroscopy of Some Pyrromethene-BF ₂ Complexes					
12. PERSONAL AUTHOR(S) T. Pavlopoulos, J. H. Boyer, K. Thangaraj, G. Sathyamoorthi, M. P. Shah, and M.-L. Soong					
13a. TYPE OF REPORT Technical		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) June 2, 1992	
15. PAGE COUNT					
16. SUPPLEMENTARY NOTATION Submitted to Applied Optics					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Laser dyes, pyrromethene-BF ₂ complexes, flash lamp excitation, photoselection spectroscopy.		
FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number) See attached					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> OTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL Joseph H. Boyer			22b. TELEPHONE (Include Area Code) (504) 286-7225		22c. OFFICE SYMBOL

Laser Dye Spectroscopy of Some Pyrromethene-BF₂Complexes

To improve the laser-action properties of the pyrromethene-BF₂ complexes (P-BF₂ complexes), we studied substitution effects at different positions of the dye molecule on the electronic spectra of several derivatives. Specifically, we used laser photoselection spectroscopy to measure the triplet-triplet (T-T) absorption and polarization spectra as well as the fluorescence and visible absorption (S-S) spectra of the following compounds: 1,2,3,5,6,7,8-heptamethyl; 8-acetoxymethyl-1,3,5,7-tetramethyl-2,6-diethyl; 1,3,5,7-tetramethyl-8-*p*-methoxyphenyl; 3,5-dimethyl-1,7-diphenyl; and 1,3,5,7,8-pentamethyl-2,6-diphenyl P-BF₂ complexes. The 1,3,5,7-tetramethyl P-BF₂ complex itself exhibits weak T-T absorption, which stretches from the green to the near IR spectral region. This band consists of two overlapping (differently polarized) T-T transitions. Short molecular axis (i.e., 8- and 1,7-positions) substitution causes the positively polarized T-T transition to gain considerably in intensity. Significantly, the negatively, long-axis polarized T-T transition was unaffected by the long-axis 2,6-position disubstitution. Therefore, only 2,6-position disubstitution is expected to produce superior new P-BF₂ complex laser dyes. Substitution effects from strongly interacting groups with chromophores on singlet-singlet (S-S) as well as T-T absorption spectra, together with cw laser photoselection spectroscopy, are briefly reviewed.



Accession For	
NTIS GRAB	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	